

18 Networks, advantages & types of

- What is a network?
- Two or more computers that are interconnected so they can exchange data, information & resources. A networked connection allows computer to communicate with other devices.
- Social networking sites allow users to exchange information.
- Using groupware enables people to work on same project at same time.

Advantages of a network

- 1 Resource sharing
 - a. Internet connection
 - b. Printing
 - c. Software
 - d. Other resources including network-attached storage (NAS) servers; (device providing file based storage to other devices connected to network)
- 2 Remote Services: ordering through the internet or in a B2B situation; where customer enters & checks data to make order; ATM eg. of remote service

Advantages of a network, contd

- 3 Sharing Information – collaborative documents, Intranet, group calendaring, etc.
- 4 Facilitating communications – email, chat, videoconferencing
- 5 Security – password protection, backups

Types of networks - by size

Local Area Network (LAN) – typically restricted to one building or one site (eg: Wedderburn College)

Wide Area Network (WAN) – spread over wide distances (eg: Commonwealth Bank)

Internet – the Network of Networks

LANs – Local Area Networks

- Geographically limited, usually to one site, for example a building or campus.
- Traditionally were all cabled but now often use wireless technology.
- Distances between buildings dictate the type of communication media used (fibre optic, radio links).
- Wireless LAN uses radio waves, satellite, microwave to transmit signals between nodes.

WANs – Wide Area Networks

- *Wide Area Network (WAN)* – broad geographic coverage (e.g. state-wide, country-wide, international)
- Communications carried by a medium owned by someone who is not part of the organisation whose data is being transmitted
- Transmission media include microwave, fibre-optic, telephone lines & satellite.
- WANs include:
 - MAN
 - Statewide network
 - National area network
 - World wide network, eg. internet

Types of networks - by architecture

- Architecture: design of a computer network; way in which they are connected.
- Client / Server – one machine (the server) serves out data or files to a number of other machines (clients)
- Peer to Peer – all devices are at the same level, no server.
- Internet Peer to Peer – allows users to connect to someone else's computer over the internet.

Client/Server

- One computer program (the 'client') asks another computer program (the 'server') to provide a service, such as looking up and providing data, delivering email, sending web pages, bank balances etc.
- The server is a larger, faster more expensive computer that is designed to handle a number of tasks at once. All server s.ware is multi-tasking; (able to process instructions from more than 1 program at the same time).
- Some different types of servers:
 - file servers, store files for use on client computers
 - application servers, store applications to enable clients access

Client/Server: types of servers

- print servers, accepts print jobs over the network faster than a printer; workstation gets on with other tasks whilst printing is done
- Database server; hold d/bases and allows them to be used by many users
- web servers, connected to Internet and serve webpages to viewers
- Domain name servers, (DNS's); translate domain names into IP addresses; browsers request the DNS to provide the IP address so that it can locate website or mail server.
- Dynamic host configuration protocol server, (DHCP), hand out the node number to each device
- Active Directory Domain controller, server running AD Dservices; stores directory data & manages communication b/w users & domains including login processes, authentication & searches.
- Virtual server; software partitions a single server so that it operates as several servers.

Client/Server: types of servers

a **proxy server** is a server that acts as an intermediary for requests from clients seeking resources from other servers. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resource, available from a different server.



the computer in the middle acts as the proxy server between the other two

Client/Server: types of servers

- A proxy server has a large variety of potential purposes, including:
 - To keep machines behind it anonymous, (security)
 - To speed up access to resources (using caching). Web proxies are commonly used to cache web pages from a web server.
 - To apply access policy to network services or content, e.g. to block undesired sites.
 - To log / audit usage, i.e. to provide company employee Internet usage reporting.
 - To bypass security/ parental controls.
 - To scan transmitted content for malware before delivery.

Peer-to-Peer networks

- Each computer on network shares its hardware and software with all other computers on the network.
- No server, so costs are low and installation is simple
- All computers and users have equal authority and rights
- Little protection of one workstation against another
- Used at home or in small organisations with trusted users
- Allows sharing of files, internet connection, printer

Internet Peer to Peer

- Users must enable their computer to be accessed by others over the internet. This allows copying of files from one hard drive to another via the internet.
- Internet music sharing networks such as BitTorrent, Limewire & Kazza are software applications that support peer-to-peer
- This style of network can expose your computer to possible security violations.

Intranets

An internal secured environment that has a similar look and feel of the internet, but operates as a LAN (ie: within one organisation).

Benefits include:

- access to info is controlled
- improves communication within an organisation
- reduces costs as requires less paper documents
- documents are easier to find and access
- less document maintenance is required.



Network Communication Standards

For different devices on a network to be able to communicate standards need to be established to enable hardware and software to be integrated.

Without standards only hardware and software from the same companies could communicate.



Network Standards

A set of guidelines that manufacturers must follow in the design and production of their hardware or software products.

They have been established to overcome the problems of incompatibility on a network and so that different hardware and software components can be integrated into any network.



Protocols

A standard that defines how two computers or devices on a network transmit data.

Like humans agreeing to speak the same language during a conversation.

For two computers to exchange data, they must be using the *same* protocols.



Protocols & Standards

Some examples of protocols and standards include:

- Ethernet
- TCP/IP
- 802.11 Wireless Standard



Ethernet

This is a network standard that describes communication over a single cable which is shared by all devices on the network.

This is the standard used on most school and home networks.

This allows "packets" of data to be sent to other nodes on the network. Each packet contains the sender's address and the destination's address as well as some data.

The length of cable must not be too long or the messages or the signal will be too weak.



TCP/IP

This is the most common method of packaging data for transmission. It is the universal protocol for internet communications. The backbone of the internet.

Is actually two complementary protocols...

TCP (Transmission Control Protocol) and

IP (Internet Protocol)

It defines how data is carried between networks.

TCP/IP

TCP (Transmission Control Protocol)

Breaks files into *packets* to be sent across the Internet or a network.

Each packet contains:

- the address of the sender
- the destination address
- Error-detecting information
- The actual chunk of data (e.g. 1K)

TCP/IP

TCP (Transmission Control Protocol)

When *receiving* files, TCP re-assembles packets back into the original file.

Any protocol that breaks files into packets is called *packet switching*.

Imagine mailing a house from Melbourne to Sydney one brick at a time.

TCP/IP

IP (Internet Protocol)...

Once a file has been chopped into packets, the IP protocol is in charge of delivering each packet to its destination.

Each packet can take a different route from A to B – the most efficient route is chosen for each packet, based on Internet conditions at that time.

Using this protocol packets tend to be smaller than other protocols because there are so many more routes available using the Internet, unlike a LAN where there is often only one option.

TCP/IP

Why use packet switching?

A single bad bit in a file can ruin an entire file.

It's easier to re-send a portion of the file rather than the whole file.

This is especially important with 'noisy' and unreliable communication paths, such as dial-up modem.

An analogy for kids:

Giving an important phone or registration number: you break it into chunks and get the listener to confirm each chunk as it is heard so errors can be detected and fixed instantly.

TCP/IP

If packets are lost or delayed in transit, TCP will detect the non-arrival and will request the server to send the missing packet again.

It will continue requesting the packet at increasingly long intervals until it gives up and breaks the connection.

802.11 Wireless Standard

This standard defines how two devices can communicate using radio waves.

Such networks are known as Wi-Fi networks. Most notebook computers now come with a Wi-Fi network interface card (NIC) which has a built-in antenna that allows transmission and reception of signals.

As this standard uses techniques similar to ethernet, it can be easily connected to a wired ethernet network.

Network Hardware & Software

Network Operating systems: software controlling traffic on the network

- 2 types of s.ware:
 - server software & client software
- Server software, eg. windows, controls file access, tracks users, authenticates access to network servers, maintains log of usage and problems
- Client software is on each workstation; establishes connection through NIC

Network Software

Web client software:

- Web browser
- Electronic mail
- Videoconferencing
- Instant messaging
- Chat room

Software for setting up websites

- http protocol; standard for transmitting & receiving information on the internet.
- Web Server software, eg. microsoft internet information services, (IIS)
- This provides content in form of html documents, images, etc.

Software for setting up websites

a **proxy server** is a server that acts as an intermediary for requests from clients seeking resources from other servers. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resource, available from a different server.



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Software for setting up websites: proxy server

- A proxy server has a large variety of potential purposes, including:
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 - To speed up access to resources (using caching). Web proxies are commonly used to cache web pages from a web server.
 - To apply access policy to network services or content, e.g. to block undesired sites.
 - To log / audit usage, i.e. to provide company employee Internet usage reporting.
 - To bypass security/ parental controls.
 - To scan transmitted content for malware before delivery.

Software for setting up websites: contd

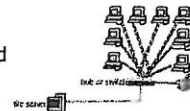
- SMTP
- Post Office Protocol, (POP3)
- File transfer Protocol, (FTP)
- Web software applications, eg. blogging software, forums, wikis.
- Cross-platform web software
 - Flash
 - java

Hardware

- The Network interface card (NIC) allows a stand-alone computer to connect to a network. These can be cabled, or wireless (radio) cards.
- Wireless access point, WAP connects wireless communication devices to a wired or wireless network
- Roaming, process of moving around a wireless network
- Hot spot, a location where user with wireless enabled device can communicate with a WAP.

Hardware – Switches

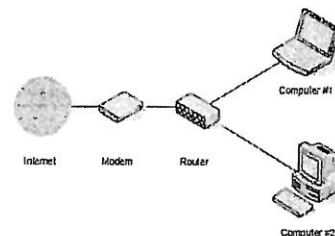
Switches store the address of every device and are capable of inspecting packets as they are received, determining the source and destination device of each packet, and forwarding them appropriately. By delivering messages only to the connected device intended, a network switch conserves network bandwidth



Hardware – Routers

- Security device that guards the connection between a LAN and the outside world (another LAN or a WAN.) A junction between 2 networks
- Can be programmed to only allow authorised incoming and outgoing traffic. E.g. it can block certain external sites or forbid MP3 music files to enter. Like an enthusiastic bouncer at the door of a club.
- Routers can protect one part of a network from another part of the same network, e.g. school admin LAN and curriculum LAN.
- They often contain a built-in firewall for security, and the firewall serves all users in the network

Hardware – Routers



Hardware – Modems

- Short for **modulator-demodulator**. A modem is a device to transmit data over telephone or cable lines.
- Computer information is stored digitally whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.
- Dial up modem, Maximum 56k
- Very slow

Digital modem



Hardware – Digital modems

- A digital modem sends & receives data & information to & from a digital connection, DSL, eg. ADSL or broadband cable.
- DSL uses existing copper phone lines; ADSL one type
- Asymmetric digital subscriber line (ADSL); asymmetric b/c more bandwidth is reserved for receiving data than sending, download speeds from 256 kbps to 8 mbps; upload speeds, 16 to 640 kbps
- Faster data transfer rates, up to 1500kbps, broadband
- Simultaneously talk on phone, send fax
- Always on
- Cost effective; no dropped connections, faster downloads, no busy signals
- Major problem is distance from station, 5 km max.
- Security issues, need firewall software

Hardware – Cable Modems

- A modem that sends and receives data over the cable TV network.
- While a 56K modem can receive data at about 53 Kbps, cable modems support data transfer rates of up to 30 Mbps. Most ISPs limit their subscribers' transfer rates to less than 6 Mbps to conserve bandwidth
- Cable modems don't connect to a phone line.
- Cable modem connects to a local cable TV line, hence the term "cable modem." This allows cable modems to have a continuous connection to the Internet. Therefore, there is no need to dial your ISP every time you want to check your e-mail.

Servers

Robust central computers at the heart of a network.

File servers are the most common server type.

There are also application servers, proxy servers, CD servers, DHCP servers, login servers etc which offer specialised services.



File Servers

File servers run the Network operating system (NOS) which offers "community services" such as:

- authenticating users during login
- controlling users' access to resources based on their rights
- managing print queues
- doing backups
- running centralised software such as virus scanners
- running services like DHCP to give out IP addresses to workstations
- controlling Internet services

File Servers

Servers don't really have anything special in terms of hardware.

Expensive because of their high-quality components, and "scalability" (expandability).

• **Memory** – servers need lots of RAM. Application servers require huge amounts of RAM to run programs for remote users.

• **Storage** – very large and fast hard disks – often RAID

File Servers - RAID

Redundant Array of Independent [or Inexpensive] Disks arrays for reliability and/or speed.

RAID uses a group of hard disks that work as a single disk under a RAID controller.

Flavours of RAID: RAID0 to RAID5 offer increasing reliability and/or speed (at ever-increasing cost). Includes mirroring (for reliability), error correction, and striping (for speed).

RAID disks are usually "Hot Swap".



3-disk raid array

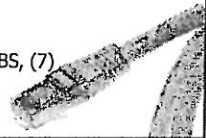
5 Transmission media

2 types of transmission media:

- Physical Transmission
- Wireless Transmission

Physical Transmission Twisted Pair cable, UTP

- Unshielded twisted pair cable (UTP)
- Types: CAT 3, CAT 5, 5E, 6, 7
- Maximum cable length: 100m
- Metal core, electrical signals
- Only one network signal can travel along a cable at a time
- Poorly shielded from electromagnetic interference
- Bandwidth: 10, 100, 1 GB, (5E), 10 GBS, (7)
- Used in star networks

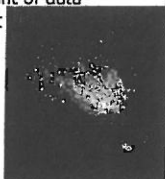


Physical Transmission Twisted Pair cable, Coaxial Cable

- Contains only two wires
- Carry data 185 mtrs at 10 Mbps
- Used in bus networks where all data travels in both directions away from any computer that originates a message
- Rarely used now except for cable internet

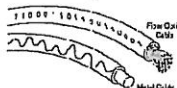
Physical Transmission: Fibre Optic Cable, FOC

- Glass or plastic core that transmits Optical (laser light) signals
- Max length: kilometres (no electrical resistance = little signal fade)
- Immune to EMI (electromagnetic interference)
- MASSIVE bandwidth & speed; (The amount of data that can be transmitted in a fixed amount of time).
- Expensive connectors needed at each end to convert between optical/electrical network signals
- FOC for long distances (> 100m), across oceans, between distant sites



Physical Transmission: Fibre Optic Cable, FOC

- Fibre optics advantages:
- Fibre optic cables have a much greater bandwidth than metal cables. This means that they can carry more data.
- Fibre optic cables are less susceptible than metal cables to interference.
- Fibre optic cables are much thinner and lighter than metal wires. Data can be transmitted digitally
- Disadvantage of fibre optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.



Wireless Transmission

- **Radio Waves**
- For radio transmissions to occur a transmitter and a receiver is required
- Wi-Fi networks use radio waves
- More flexible than cable but slower
- Bluetooth uses short-range radio waves to transmit data, up to 10 mtrs. Data transfer of 2Mbps c/f Wi-Fi of up to 108 Mbps



Wireless Transmission

- **Microwaves**

- Require line-of-sight transmission
- Very high data rates, eg. 4 Mbps over 5 kms.

- **Satellite**

- In the form of radio waves or microwaves
- Average download rate 1 Mbps
- Limitations: distance the waves have to travel to the satellite & back & among the most expensive ways of gaining broadband Internet access
- In rural areas it may be the only choice

Wireless Transmission

- **Microwaves**

- Require line-of-sight transmission
- Very high data rates, eg. 4 Mbps over 5 kms.

- **infra-red transmission**

- Uses light waves & requires line-of sight
- Effective up to 5 mtrs
- Slow data transfer rates but can be useful with hand held computers with this port to communicate to printers or pc

6 Network Physical Security

File server failure can severely affect network users.
Server security:

- Locked in air-conditioned, alarmed room with barred windows, restricted keys
- No user access to server
- Uninterruptible power supply (UPS) protects against blackouts, brownouts and voltage spikes.
- Accessible fire fighting equipment.

Network Security

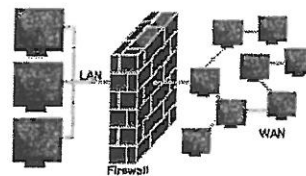
• Usernames & passwords

- Passwords are not strong protection – they can be guessed, forgotten or stolen.
- Characteristics of good passwords
 - At least 8 digits long
 - Include non-alphabetical characters
 - Not easily guessed
 - Be changed regularly, eg. monthly

Network Security - Firewall

- Server & software combination filtering data through an internet connection into an organisation's internal network
- Use of filters to examine information
- Blocking access to certain domain names
- Banning certain protocols from accessing servers
- Words and phrases included in packets of information
- Firewalls use two separate NICs; one connected to internal network & other to outside world; material only moves from one card to the other through the CPU of the server computer that is acting as firewall
- Proxy server is a firewall technique where it intercepts all messages entering and leaving the network.

Network Security - Firewall



An illustration of where a firewall would be located in a network.

Network Security

• Malware protection

- Virus protection software
- Firewall
- Anti – adware programs

• Encryption

- Process of translating data into a secret code that can only be read by authorised users
- WPA or WPA2 is a security protocol for use by wireless LANS.
- It encrypts data sent over radio waves
- encrypted data known as ciphertext

Secure Websites

- To allow secure financial transactions across the internet the hypertext transfer protocol security (https) is used
- Web browsers use encryption to connect to a "Secure" SSL (Secure Socket Layers) site.
- In some browsers a locked padlock in the status bar indicates a secure site; others display https:// in the URL

Types of online communities

1. **Social networks and communities**
2. **Professional or work-based communities**
3. **Project and interest based communities**



Online community: online space where groups of people share words & ideas using web-based technology

Social networks and communities

- A social networking site encourages members to share interests, stories, thoughts, photos & videos with other members of the community.
- Users are able to post personal information, photos, videos, etc.
- Primary objective is socialising.
- Most content generated doesn't add to knowledge bank of internet.
- No real governance over what they post into these communities.

Personal Profile Sites

- personal profile sites allow users to create:
- Profile page which includes the wall, information, photos & videos. Egs. Of are Facebook, Google wave, Myspace



social networking tools:

- Facebook
 - is a social networking tool that allows users to broadcast their status, collaborate on events and knowledge share links to websites of interest.
- twitter
 - A micro-blogging tool that allows users to document what they are doing in 140 characters
 - Strengths, eg. natural disasters, users can get information out quickly
 - Weaknesses, no moderation & environment is social
- Social networking sites lead to blurring of social & professional lives

Professional or work-based communities

- Eg, websites, discussion areas, mailing lists
- Clear purpose
- Established to facilitate learning & discussion kept to on topic
- Membership is often closed & requiring verification to access
- Usernames reflect real names and don't hide behind avatars
- Rely on quality content and regular participation from members to drive the community

Project and interest based communities

- Created by enthusiastic individuals and often managed by volunteers
- Open to the public
- Have free m/ship
- Encourage the exchange of ideas through tutorials, advice, etc.
- Egs. clubs, eg. Morris Minor Car Club; project-based communities, Handmade Help blog

Website that support online communities

1. Wikis
2. Blogs
3. Forums
4. Social networking sites

Wikis



Wikis

The simplest online database that could possibly work

Wiki features

- Collaborate using modifiable web pages
- Automatic web page linking and creation
- Changes are INSTANTLY published
- Page change notifications via email
- Control user access and privileges
- File sharing
- Page index and full text search
- List and restore previous page versions



Membership and access to a Wiki site can be easily managed ...

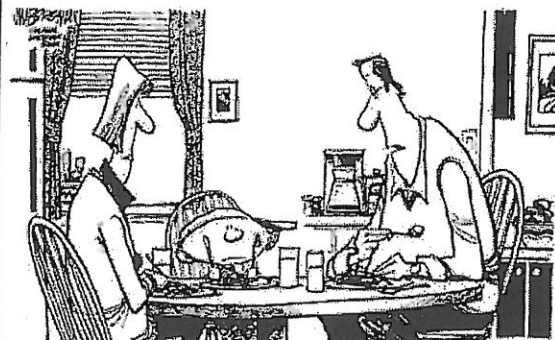
Wiki Level	Access	Education Use
1. Public wiki	Anyone in the world can view. Anyone can become a member. Anyone can edit, contribute or delete.	Great if you appreciate global contributions eg. Wikipedia, but you must rely on "Soft Security" to maintain order.
2. Protected wiki	Anyone in the world can view. Only those allowed by the organiser can join and become a member. Only members can edit, contribute or delete.	These are most popular for classroom use. Mum, Dad, Gran and the world can view, but only members, with recognised usernames and their own passwords, can change or delete anything and contribute to discussions.
3. Private wiki	Only members can view. Only those invited by the organiser can join and become a member. Only members can edit, contribute or delete.	These are the walled gardens of the wiki world. Perfect for closed discussions. Only participating members can enter and view, edit or discuss content. No lurkers.

Wikis

Strengths:

- Ease of use and openness
 - Multiple people can work on same document and thus source of free information
- ### Weaknesses
- Openness leaves wiki susceptible to vandalism
 - Uses soft security; It works socially to *convince* people to be friendly; assumes good faith and aims to limit damage.

Blogs



Blogs

- A website with only one main page, an online journal
- Usually maintained by a single person, making regular entries
- Entries recorded in reverse chronological order
- Blogs usually public and visitors can leave a comment

Forums

- Forums, an online message board or discussion website
- Users add comments or posts
- A thread is a collection of posts defined by a title, description that may summarise the intended discussion

Purpose of an online community:

- 1 To broadcast information and events using various tools
 - Tools, simple website, a blog, email mailing list or twitter account
 - RSS feed, users receive content from a variety of sources
- 2 To facilitate discussions, collaboration & information using tools
 - For collaborative problem solving to work well:
 - Form a team with a common purpose, voluntary m.ship, equal access and goals achievable with a time limit.
 - Tools include synchronous, real time, eg. chat & video conf; & asynchronous collaboration, email or discussion thread.
- 3 To store and develop organisational knowledge
 - Tools for knowledge sharing and exchange:
 - Wikis, microsoft sharepoint, groupware, content management systems, eg. Ultraset.

Characteristics of an Online Community:

In setting up an online community characteristics of communities need to be taken into account:

1. Online communities appealing to gender groups
2. Online communities appealing to special needs
3. Online communities appealing to cultural needs
4. Age-restrictive and age-targeted communities
5. Access requirements need also to be considered, (open or closed).

Non-Technical Constraints on developing a website for a community

- 1 Ensuring privacy in an online community
 - Strategies that co-ordinators can put in place to decrease the risk of privacy attacks:
 - Requests for membership verified, eg. 24 hrs waiting time; also word verifications
 - Complex passwords
 - Administrators observant to ensure protocols are not broken
 - The Information Privacy Act protects privacy, data collected can not be used for any other purpose without consent

Non-Technical Constraints on developing a website for a community

- 2 Copyright in online communities
 - Copyright considerations to be taken into account when setting up a community:
 - Do you own the images & text
 - Are you broadcasting discussions and ideas in an open forum
- 3 Human rights requirements
 - The Human Rights & Responsibilities Charter covers members' freedom, respect, equality and dignity.
 - No encouraging of hate crimes or religious vilification of others
 - Discrimination on any basis
 - No encouraging of victimisation
 - No assisting or authorising of others to engage in these activities
- 4 Social online protocols

Problem Solving – 4 Stages

- Analysis
- Design
- Development
- Evaluate
- (ADDE)
- Note: In this unit Evaluate is not covered in depth.

problemsolving

Problem Solving: 1 Analysis

1. Determining the solution requirements
 - Define the problem in a simple problem statement
- The aim of problem analysis is to ensure that the problem is clear enough to effectively analyse it and efficiently solve it.
 - Efficiency, refers to time, cost & effort put into producing an information solution
 - Effectiveness, quality, relevancy, timeliness and clarity of information product
- Need to identify where data is coming from for online community – inside or outside

problemsolving

Problem Solving: 1 Analysis

- Indigenous Language Trust, Case Study, (ILT)

The Indigenous Language Trust (ILT) is a non-profit community group aimed at preserving and developing Indigenous language in Australia.

The trust was set up 23 years ago when local Aboriginal elders realised that Indigenous language in Australia was slowly dying. When ILT first began, there was only one office in Melbourne. Within five years another office had opened in Albury and there is now an office in each capital city.

Over the year, each of these offices worked independently to build up its expertise and contacts within their local communities. Exchanging information between the offices has been difficult, due to the different time zones. Recently, as part of a government initiative, a consultant was brought in to review the work practices of the group and to identify ways in which the community could exchange information more efficiently.

At the conclusion of the review, the consultants identified that the ILT would benefit from a website that would support information exchange between offices.

problemsolving

Problem Solving: 1 Analysis

define problem:

ILT Summary

The Indigenous Language Trust (ILT) has been operating for years and the mode in which members exchange information between offices has been inefficient. Each office has its own data and information, and to exchange this information using traditional communication methods such as telephone, fax, mail and email takes time and often results in the mismanagement of information across the organisation. This affects the quality of information within the organisation.

How can the ILT exchange information with minimal effort, yet maintain the quality of the information exchanged?

problemsolving

Problem Solving: 1 Analysis

identify information:

between the offices and where the information is stored.

When considering the information required, we need to get a clear understanding of how the information in question will be used. In the case of the ILT, each office needs to be able to get access to the information stored by each other office. It doesn't have to be processed to a single format; it just needs to be available to each office in a simple format.

problemsolving

Problem Solving: 1 Analysis

identify Solution requirements:

- In the case of the ILT they might exchange:
 - contacts – for example, who can we contact for advice?
 - policy documents – for example, regarding the management of images of deceased people
 - documentation regarding local Indigenous history – for example, images and audio files in which elders talk about their region
 - information regarding national cultural heritage – for example, statistics regarding population, literacy and health issues.
- The data for this information might come from within the organisation or from outside the organisation.

problemsolving

2 Problem Solving: Designing a website solution

- Identifying how a solution will function
- Taking into account the technical constraints a range of functional design tools can be used to show the functionality of the website.
- IPO Charts

problemsolving

2 Problem Solving: Designing a website solution

- Identifying how a solution will function
- Flowcharts; 4 symbols

FIGURE 2-12
Simple flowchart symbols.

problemsolving

2 Problem Solving: Designing a website solution

- Identifying how a solution will function
- Layout diagrams

problemsolving

2 Problem Solving: Designing a website solution

- Website map

problemsolving

2 Problem Solving: Designing a website solution

- Storyboard

problemsolving

2 Problem Solving: Designing a website solution

- Techniques web developers can use to ensure website is efficient:
 - Templates and cascading style sheets, (use of common formats on every page)
 - Use of thumbnails
- Effectiveness
 - Check appearance in different web browsers for appearance changes
 - Allowing colour of a visited link to change when visitor has clicked on it
 - Consistent layout throughout website
 - Clearly displayed information on pages

problemsolving

Problem Solving: 1 Analysis

- Identifying the functions needed for the online community solution, 2 categories
 - **Function** of a website determined by its ability to broadcast information, exchange information and store knowledge.
 - **Attributes** of a website involve, ease of use, user friendliness, reliability, portability, robustness, ability to be maintained

problemsolving

Problem Solving: 1 Analysis, ILT – functions of the website solution

- In analysing the functions needed for the Indigenous Language Trust online community, the following decisions were made about the functions of the website:
- to broadcast information to the community (open) about events and the projects they are involved in
 - to exchange information between offices about projects they are working on and any challenges they are having (closed)
 - to encourage community groups to exchange information in a secure environment
 - to store documents containing knowledge about the organisation in a central secure environment
- These are the attributes of the website:
- Most of the employees of the Indigenous Language Trust are confident using applications associated with day-to-day office tasks but not many have experience in the online environment. The user friendliness of the solution needs to be high.
 - Although the online community will become essential to the operation of the Indigenous Language Trust, the operation of it is not critical to the day to day workings of the organisation.
 - Maintaining the solution needs to be done by someone within the organisation. If it is an existing person, then the maintenance needs to be manageable.

problemsolving

Problem Solving: 1 Analysis

2 Identify the constraints on the solution

- **Technical**
 - Cost of the solution
 - Speed or time taken to access or exchange information
 - How secure the solution needs to be, closed or open
 - Number of people accessing online community at same time
- **Non-technical**
 - Are there issues of privacy when exchanging information
 - Are there copyright issues to be considered
 - Are there cultural constraints, eg. ILT Case study rules relating to using images of deceased Aboriginals and use of their names on public documents.

problemsolving

Problem Solving: 1 Analysis

3 Determine the scope of the solution

- Consider benefits of the solution on efficiency and effectiveness within organisation.
- Scope clearly outlines what solution can and can't do
- Provides design stage with guidelines
 - ILT Case Study, benefits on efficiency:
 - Time, reduced time to access & exchange information
 - Cost, reduced cost as workers in different offices can access information centrally
 - Effort, less effort as personnel in each office can build on information they already have rather than having to rediscover it

problemsolving

Problem Solving: 1 Analysis

3 ILT Case Study, benefits on effectiveness:

- Improved quality of decision making due to collaborative nature of information exchange
- Relevancy & timeliness, information broadcasted to the public is this
- Completeness, information compiled using collaborative tools by online community will be more complete

problemsolving

2 Problem Solving: Designing a website solution

- **Identifying how a solution will function**
 - Information architecture, structure of website and its navigation pathways and a website map represents this.

problemsolving

2 Designing a website solution

- **Navigation Design**
- Placement of navigation bars
- Accessibility of website; labels of icons meaningful, use of common icons; navigation appear on every page
- Use of a style guide
- File naming conventions
 - Index page is first page, eg. index.htm
 - Filenames short and meaningful
 - Limited to 16 characters

problemsolving

2 Designing a website solution

- **Identifying how a solution will appear using design tools**
- **Mock-up diagram**
 - sketch of actual website
 - Picture or webpage will look like, eg. layout, colors, fonts, general graphics
- **Layout diagrams**
 - Visual representation of how final product should look
 - Drawn by hand and contain information where text and graphics located
- **Storyboard designs**
 - Design features of each individual page

problemsolving

2 Design - Format & Conventions

- Screen size
- Index or home page; contact email, date last modified, author or company's name & contact
- Scrolling
- Text
- Navigation
- Font selection
- Images and file size
- Style guides

problemsolving

2 Design - Evaluation Criteria

- Does the solution meet the needs of the organisation
- Completed often after website been accessed and used
- Use efficiency and effectiveness as a scaffold

problemsolving

3 Developing a prototype website

- A prototype website demonstrates navigation options, a user interface and the overall functionality of a website

Development stage of PSM involve:

- 1 Using validation: Manual & electronic
- 2 Manipulation to build a solution
 - Image compression
 - Cascading style sheets
 - Meta tags

problemsolving

3 Developing a prototype website

- Testing the prototype solution:
 - Function
 - Webpages load up
 - Navigation design works
 - Relative & absolute links work
 - Images load
 - Appearance
 - Acceptable formats & conventions applied
 - Meets gender, special & cultural needs of users
 - Navigation bar easily identified on every page
 - Bottom of each page clear indication of who created it

2 Problem Solving: Evaluation Criteria

- Evaluation criteria used to judge whether solution has fulfilled the requirements identified in the analysis stage.
- Use efficiency and effectiveness as starting point
 - Does online community allow people to access information in a timely manner, (effectiveness)
 - Allow members to communicate more easily, (efficiency)
 - Cut down on costs associated with sharing, (efficiency)

problemsolving

2 Problem Solving: Evaluation Criteria

- Evaluation of ILT case study:

ILT – evaluation criteria

As part of the design stage of problem-solving, criteria should be established so that we can thoroughly evaluate that the site meets the needs of the organisation.

If, as part of the scope, we have identified that users should be able to login to a closed section of the website to access sensitive organisational information, then our evaluation criteria should clearly identify this.

Similarly, if the purpose of the website was to be user friendly, then as part of our evaluation criteria, we can survey the users to seek out their opinions on how user-friendly the site actually is.

problemsolving

3 Developing a prototype website

- A prototype website demonstrates navigation options, a user interface and the overall functionality of a website

Development stage of PSM involve:

- 1 Using validation: Manual & electronic
- 2 Manipulation to build a solution
 - Image compression
 - Cascading style sheets
 - Meta tags, apply to all images, also used by web designers to ensure that search engine bots record accurate information about their website

problemsolving

3 Developing a prototype website

- Testing the prototype solution:

– Function

- Webpages load up
- Navigation design works
- Relative & absolute links work
- Images load

– Appearance

- Acceptable formats & conventions applied
- Meets gender, special & cultural needs of users
- Navigation bar easily identified on every page
- Bottom of each page clear indication of who created it

problemsolving

3 Developing a prototype website

- Effective testing tables
 - Use of table and annotated printouts
 - Listing every test that needs to be conducted
 - What test data needs to be used to perform the test
 - Expected results if the test is performed
 - What actually happens when the test is performed
 - How errors are corrected

problemsolving

Effective testing tables

Description of the test	Test data to be used	Expected results of the test	Actual results of the test	Are there errors to correct?
Test 1: Checking the navigation bar works on the home page	Click on each link and follow it in direction that it works as expected	Each link in the navigation bar works	Click worked as expected	Actual result = required result
Test 2: Testing that the closed section of the website is protected with a password	Test data #1: correct password: jkl Test data #2: incorrect password: 12345	When the correct password is entered, the user will be taken to the closed section of the website	Did not work as expected. New password screen came to get result.	Actual result = incorrect result. Check password for the closed section of the website
Test 3: Testing that the image load correctly	Test data #1: image: jkl Test data #2: image: 12345	Typing in the image: jkl password will result in a dialog box error	Image loaded correctly	Actual result = required result
Test 4: Testing that the page load time is less than 5 seconds	Test data #1: page load time: 12345 Test data #2: page load time: 12345	Expected loading time should be less than 5 seconds	Actual loading time: 4.7 seconds (satisfactory)	Actual result = required result. The download speed is OK.